MicroLab User Guide for the MicroLog and MicroLogPRO

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Using the Guide

This user guide describes how to operate the MicroLog 8-bit and MicroLogPRO 10-bit data loggers, each one controlled by the MicroLab software. These loggers are used to monitor temperature and humidity in a variety of applications, such as perishable goods and controlled environments. Each logger can also be connected to external sensors in order to monitor additional parameters. Each logger comes in two models:

MicroLog

- EC600 with internal temperature sensor, and one external input
- EC650 with internal temperature and humidity sensor, and one external input

Using the Guide

MicroLogPRO

- EC700 with internal temperature sensor, and one external input
- EC750 with internal temperature and humidity sensor, and one external input

Chapter 1 - Overview for operating the MicroLog data logger
Chapter 2 - Overview for operating the MicroLog data logger
Chapter 3 - Overview for running the MicroLab software, which support the MicroLog and MicroLogPRO data loggers.
Chapter 4 – Specifications of the external sensors connecting to the data loggers
Specifications – Spec sheets for the data loggers and software

Compliance with FDA Title 21 CFR Part 11

To achieve compliance with FDA Title 21 CFR Part 11, use Fourier Systems' software package: *MicroLab* together with *DatPass*. The DatPass software is Fourier Systems' administration software. Among other features, it defines the users that can log onto the MicroLab software, their passwords and the digital signatures the users are permitted to sign data within electronic records (files). DatPass also maintains an audit trail to keep track of all action performed within the system. The system is secured with a serial port dongle, without which the MicroLab and DatPass software packages will not operate.

Chapter 1 MicroLog

MicroLog can be used as a stand-alone device to monitor temperature and humidity levels. All viewing, exporting and printing of the data obtained is done with just two keys. MicroLog continuously displays the most recent recordings, along with the maximum and minimum values for a selected time interval. Users can also define minimum and maximum alarm levels for a specific shipment, and the display screen will begin to flash if either level is breached.

The data stored by MicroLog can be downloaded to any computer for further viewing and analysis using the MicroLab software, and can be exported to a spreadsheet.

1.1. Getting Started

In order to save battery life, MicroLog is shipped in Stop Mode. This means that before you can start recording, you

must first connect MicroLog to the PC and set it up with the accompanying software. To set up MicroLog with the MicroLab software, refer to section Chapter 3.
Once MicroLog receives the setup command, it begins logging the data immediately.

1.2. Working with MicroLog

1.2.1. Data Displays

Current data

When MicroLog is recording, the data from the sensors is displayed alternately. The data obtained from external sensors is displayed with a small EXT symbol.

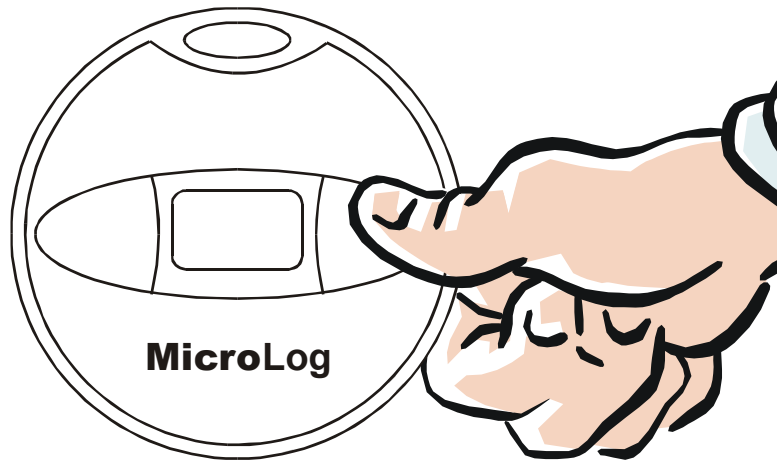
When MicroLog stores the data, the LCD display briefly changes to a “double dash” (- -) symbol.

Minimum and maximum values

You can display minimum and maximum values for any hour from the last 24 hours and for any day from the last 30 days by using MicroLog’s left and right keys:

Viewing Min. and Max Values in the Last 1-24 Hours

1. Select a time period by pressing the right key on the

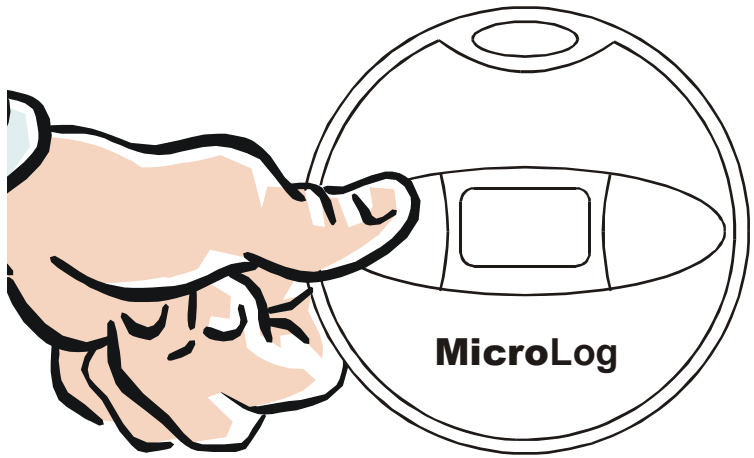


MicroLog. The LCD will begin displaying the hour number, ranging from hours 1 to 24. Once you've reached the desired time period, release the right key.

2. Once you've released the right key, MicroLog will display the Min and Max values logged by the sensors during the selected time period.
3. (Optional) Once the left key is released, MicroLog will send an IR signal of the Min and Max values for the selected time period. To receive a printout of this data, simply point the MicroLog to the IR printer (HP portable printer – model No. 82240B).

Viewing Min. and Max Values for the last 1-30 Days

1. Select a time period by pressing the left key on the MicroLog. The LCD will display the day number, ranging from days 1 to 30. Once you've reached the desired time period, release the **left** key.

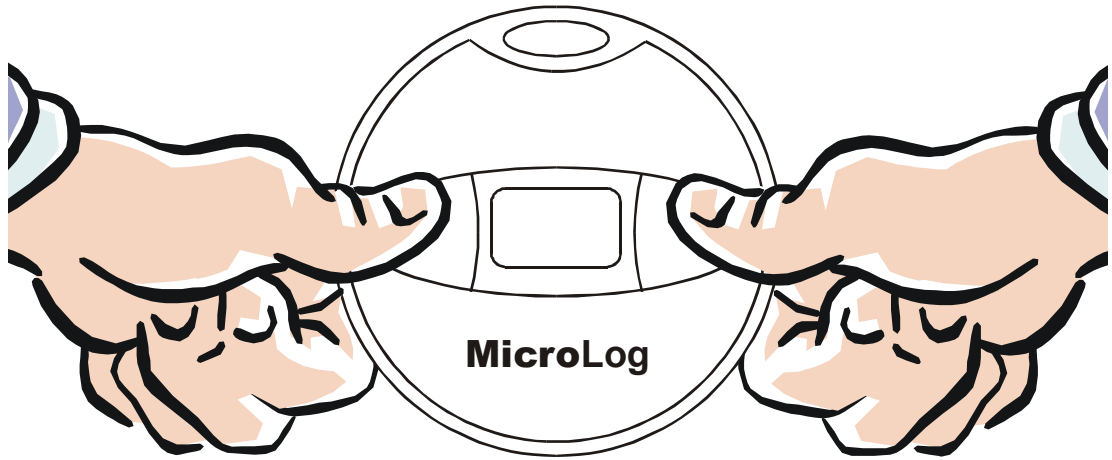


2. Once the left key is released, MicroLog will display the Min and Max values of the sensors for the selected time period.
3. (Optional) Once the left key is released, the MicroLog will send an IR signal of the Min and Max values for the selected time period. To receive a printout of this data, simply point MicroLog to the IR printer (HP portable printer – model No. 82240B).

Status messages

When both the left and right keys are pressed simultaneously, the MicroLog LCD will display MicroLog's status. This will also "wake up" the device, a step necessary

for its communication with a computer. The status messages include:



– Run

– Cyclic Run

– Timer Run

– Stop Mode

– Downloading data to a PC

1.2.2. Working Modes

MicroLog is always set in one of the 4 possible modes:
Stop – MicroLog is idle and is not recording.

Run – MicroLog is recording data. It will stop recording automatically when its memory is full (16,000 recordings).
Cyclic Run – Same as Run, but MicroLog will record over the old data when the memory is full, beginning with the earliest data recording.
Timer Run – MicroLog can be configured to start recording at a predetermined time. When MicroLog is set for such a run, its status is set to Timer Run. Once MicroLog starts recording, its status changes to either Run or Cyclic Run, depending on the desired configuration.

1.2.3. MicroLog's Connections

Note: MicroLog ships with a rubber plug that covers the rear socket. The plug protects the socket from moisture. Unless you are using the socket leave the plug in.

Connect MicroLog to a computer

For this you will need a serial communication cable (catalog number DT058).

The serial communication cable ends with a type D 9-pin female plug. Plug this in to any free COM port on your computer.

The other end of the serial communication cable ends with a small black flat plug. Plug this end into the socket at the back of the MicroLog.
Note that the socket has three pins, with one further away from the other two (Figure 4). Take care to plug the cable in correctly.

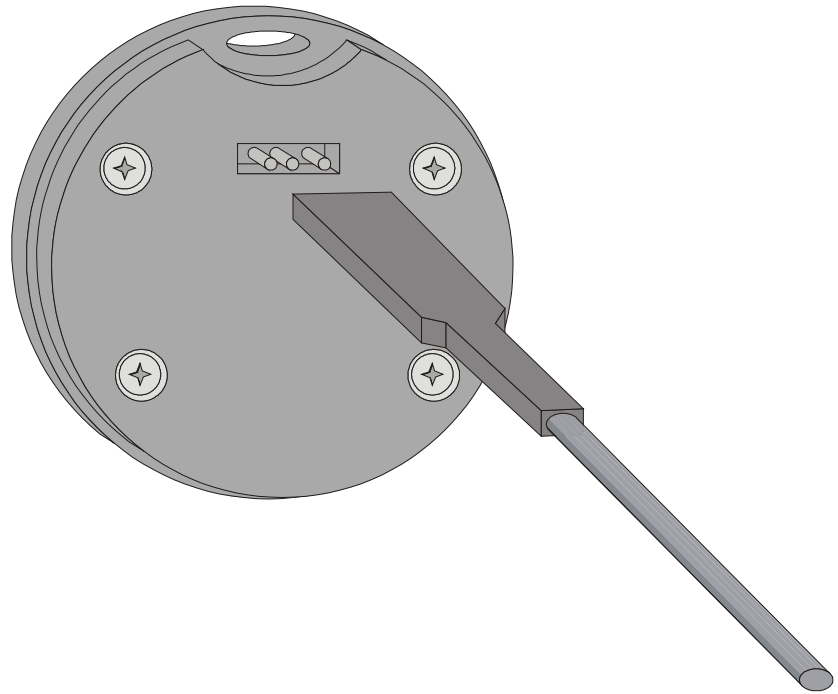


Figure 1: Connecting MicroLog

Connect MicroLog to an external sensor

Use the same PC connection socket to connect to an external sensor (see Figure 4).
Note that the socket has three pins, with one further away from the other two (Figure 4). Take care to plug the cable in correctly.

1.2.4. Sleep Mode

The MicroLog battery's maximum lifespan is approximately 1.5 years. This long battery life is achieved by MicroLog putting itself "to sleep" between recordings, or after 4 minutes goes by without communication with the computer. While sleeping the data logger consumes a minimal amount of power.

MicroLog "wakes up" every second for a very short time (a few micro-seconds) to check if one of the keys has been pressed or if there is a message coming in from the computer. This is the reason you have to press and hold a key for at least two seconds before a status message appears.

If you use high sampling rates, the MicroLog battery's lifespan will be considerably shorter (see Figure 5).

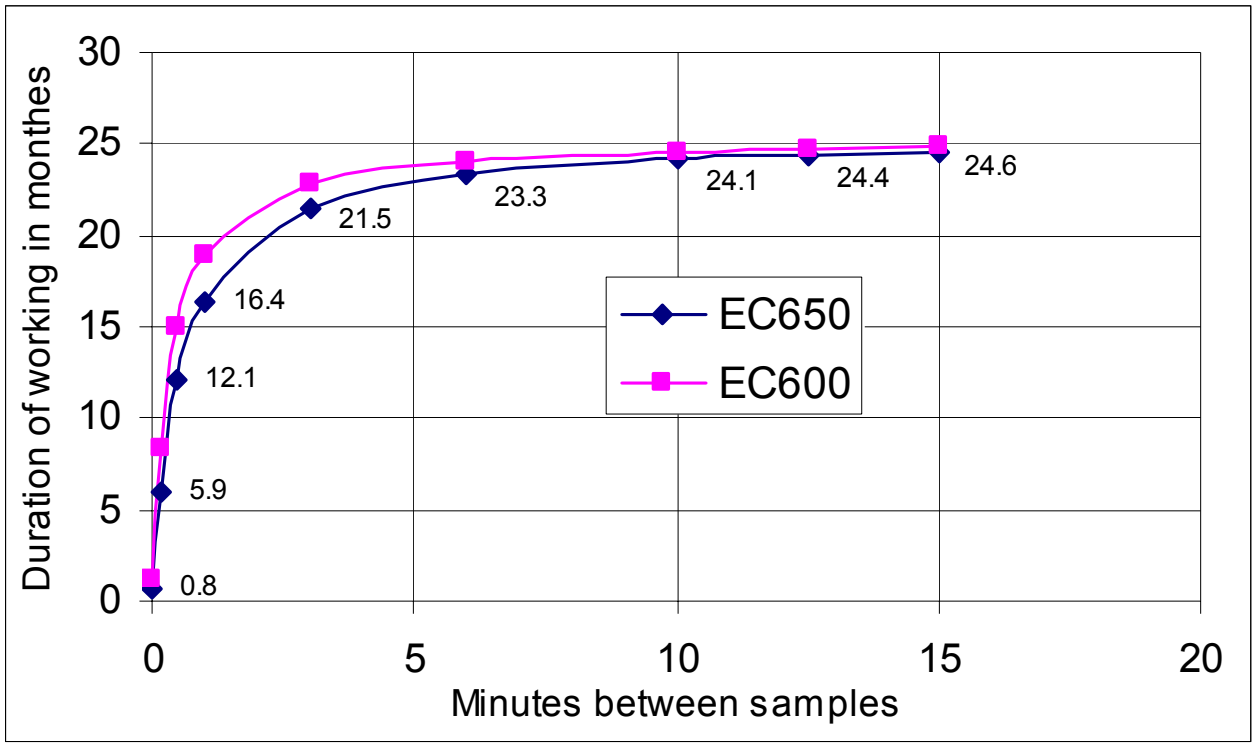


Figure 2: MicroLog battery life

Note: The figures on the graph refer to MicroLog usage without daily download and without viewing min/max values on MicroLog's display

1.2.5. Replacing the Battery

Warning: The back cover of the MicroLog contains a special compartment for the fragile humidity sensor. When removing or replacing the cover, be careful not to harm the sensor.

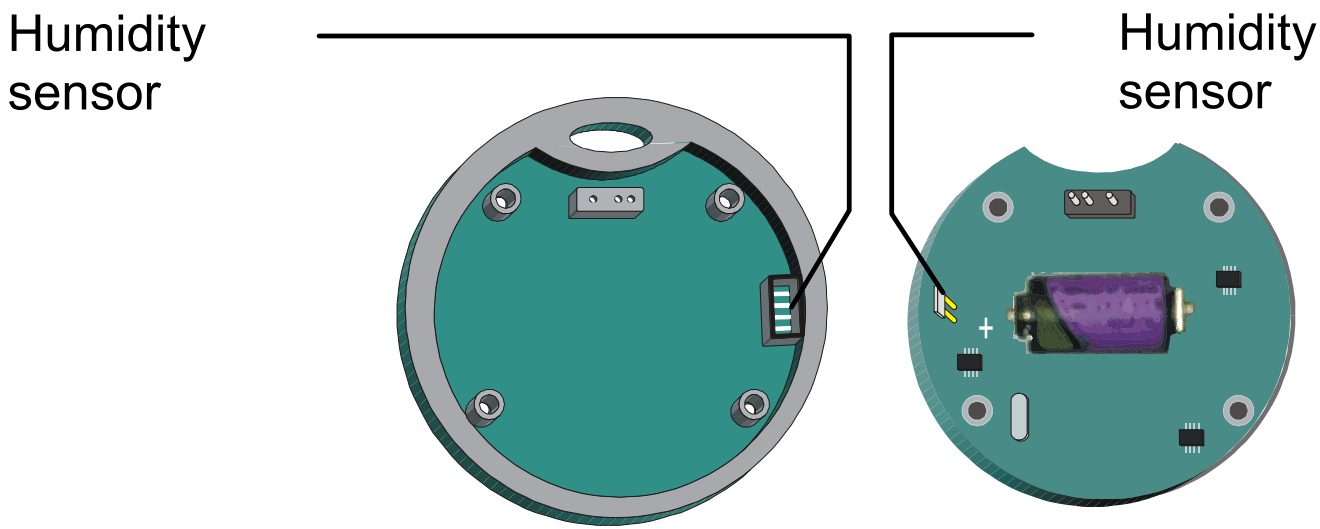


Figure 3: Replacing the battery

Note: The MicroLog uses a 1/2AA 3.6V lithium battery.

1. Unfasten the four screws on the back of the MicroLog.
2. Carefully remove the back cover
3. Replace the battery, and be sure to insert the new battery into the correct corresponding polarities (look for the "+" symbol next to the positive terminal)
4. Carefully reposition the electronic board on MicroLog's back cover and make sure that the humidity sensor is placed in its compartment.
5. Refasten the four screws on the back of the MicroLog.

Chapter 2 MicroLogPRO

Chapter 2 MicroLogPRO

2.1. Overview

MicroLogPRO can be used as a standalone device to monitor temperature and humidity levels. All viewing, exporting and printing of the data obtained is done with just two keys. MicroLogPRO continuously displays the most recent recordings, along with the maximum and minimum values for a selected time interval. Users can also define minimum and maximum alarm levels for a specific shipment, and the display screen will show alarm icons if either level is breached.

The data stored by MicroLogPRO can be downloaded to any computer for further viewing and analysis using the MicroLab software, and can be exported to an Excel spreadsheet.

The data can also be easily transmitted to an infrared printer.

2.2. Getting Started

In order to save battery life, MicroLogPRO is shipped in *Stop Mode*. This means that before you can start recording, you must first connect MicroLogPRO to the PC and set it up with the accompanying MicroLab software. To set up MicroLogPRO with the MicroLab software, refer to section Chapter 3.

Once MicroLogPRO receives the setup command, it begins logging the data immediately or waits for a predefined time to start logging.

2.3. Working with MicroLogPRO

2.3.1. Data Displays

Current Data

When MicroLogPRO is recording, the data from the sensors is alternately displayed. The data obtained from external sensors is displayed with a small EXT icon.
When MicroLogPRO stores the data, the LCD display briefly changes to a *four dash* (- - - -) symbol.

Minimum and Maximum Values

You can display minimum and maximum values, ranging from the last

1 - 24 hours and from the last 1 - 30 days, by using MicroLogPRO's left and right buttons:

Viewing Min. and Max Values in the last 1-24 Hours

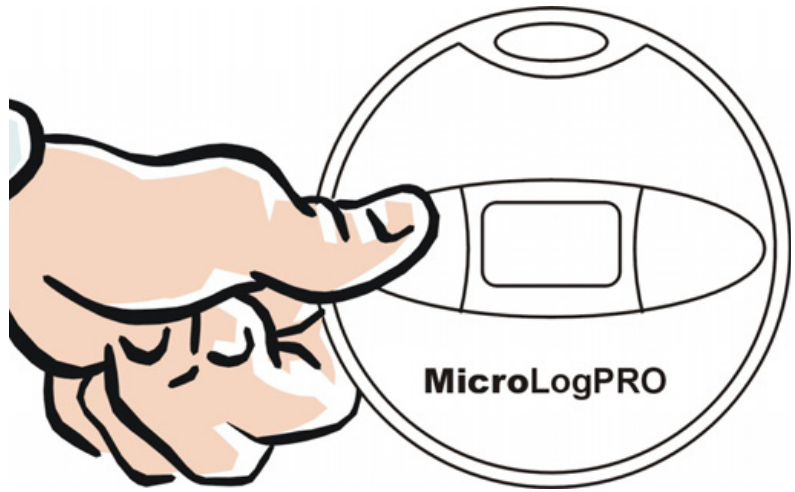
1. Select a time period by pressing the **right** button on the MicroLogPRO. The LCD will begin displaying the hour number, ranging from 1 to 24 hours. Once you've reached the desired time period, release the right

button.

2. Once you've released the right button, MicroLogPRO will display the Min and Max values logged by the sensors during the selected time period.
3. Once the button is released, MicroLogPRO will also send an IR signal of a predefined data options. To receive a printout of this data, simply point the MicroLogPRO to the IR printer (HP portable printer – model No. 82240B).

Viewing Min. and Max Values for the last 1-30 Days

1. Select a time period by pressing the **left** button on the MicroLogPRO. The LCD will display the day number, ranging from 1 to 30 days. Once you've reached the desired time period, release the left button.



2. Once the left button is released, MicroLogPRO will display the Min and Max values of the sensors for the selected time period.
3. Once the left button is released, MicroLogPRO will also send an IR signal of a predefined data options. To receive a printout of this data, simply point the MicroLogPRO to the IR printer (HP portable printer – model No. 82240B).

Status Messages

When both the left and right buttons are pressed simultaneously, the MicroLogPRO LCD will display MicroLogPRO's current working mode and version.

After releasing these buttons, MicroLogPRO will display its internal software version (if the letter H appears next to the version number, this means that this model includes a built-in humidity sensor as well as a temperature sensor)

The status messages include:

– Run

– Cyclic Run

– Timer Run

– Stop Mode

– Downloading data to a PC

– Push to Run

– Sending data to an IR printer

2.3.2. Working Modes

MicroLogPRO is always set in one of 5 possible modes:
Stop – MicroLogPRO is idle and is not recording.
Run – MicroLogPRO is recording data. It will stop recording automatically when its memory has reached full capacity (52,000 samples with one sensor).
Cyclic Run – Similar to Run mode, but MicroLogPRO will record over the old data when the memory is full, beginning with the earliest data recording.
Timer Run – MicroLogPRO can be configured to start recording at a predetermined time. When MicroLogPRO is set for such a run, its status is set to Timer Run.
Push to Run – MicroLogPRO will only begin logging data when the user pushes either the left or right buttons.

2.3.3. Alarm Levels

MicroLogPRO displays an alarm notification whenever any alarm level is exceeded.

AL-L – A sensor's reading is *lower* than its low alarm level.

AL-H – A sensor's reading is *higher* than its high alarm level.

The alarm notification remains until the next time you view Min/Max values or download data to a PC.

To learn how to set alarm levels, refer to page 78.

2.3.4. MicroLogPRO's Connections

Note: MicroLogPRO ships with a rubber plug that covers the rear socket. The plug protects the socket from moisture. Unless you are using the socket, leave the plug in.

Connecting MicroLogPRO to PC Serial Port

For this you will need a Serial communication cable (catalog number DT058).

The serial communication cable ends with a type D 9-pin female plug. Plug this in to any free COM port on your computer.

The other end of the serial communication cable ends with a small black flat plug. Plug this end into the socket at the back of the MicroLogPRO.
Note that the socket has three pins, with one further away from the other two. Take care to plug the cable in correctly.

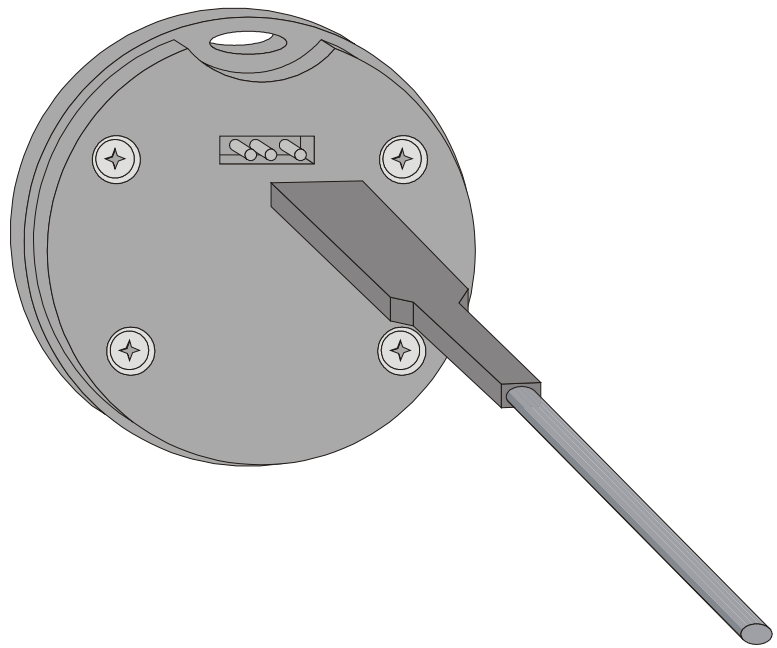


Figure 4: Connecting MicroLogPRO

Connecting MicroLogPRO to PC USB Port

With MicroLogPRO model EC750 only, you may connect the logger to the PC USB port using the mini USB cable socket on the side of the logger.
Once you connect the logger to the PC you will be required to install the logger USB driver in order for the MicroLab software to detect the logger. Refer to page 47.

Connecting MicroLogPRO to an External Sensor

Use the same PC connection socket to connect to an external sensor (see Figure 4).
Note that the socket has three pins, with one further away from the other two (Figure 4). Take care to plug the cable in correctly.

2.3.5. Sending Data to an Infrared Printer

MicroLogPRO can send data to an infrared printer. There are two formats of data sending. In one format, MicroLogPRO sends the minimum and maximum values of a selected time period up to the last 30 days. The second format enables you to send all data up to 80 rows of data. Programming MicroLogPRO to the desired mode is done via MicroLab software (refer to page 98).

Sending Min/Max Values

1. Select the time period as in viewing the min/max values (refer to page 24)
2. Release the button.
3. Point MicroLogPRO to the IR printer (HP portable printer – model No. 82240B).

The printout includes MicroLogPRO's serial number and comment, alarm levels, the minimum and maximum values for each sensor and the time duration of any breaching of the alarm levels.

Sending all of the Data

1. Point MicroLogPRO to the IR printer.
2. Push any button on the MicroLogPRO logger.

The printout includes MicroLogPRO's serial number and comment, alarm levels, and a table of pre defined number of rows including time column, sensors readings columns and a column with an asterisk for each time any of the alarm levels was exceeded.

2.3.6. Battery Level

MicroLogPRO displays a battery level indicator at the top right corner of the LCD screen – a battery icon with bars in it. Three bars indicate a full battery and an empty icon indicates a low battery that needs replacing.

The MicroLogPRO battery's maximum lifespan is approximately 2 years. This long battery life is achieved by MicroLogPRO putting itself *to sleep* between recordings, or after 4 minutes goes by without communication with the computer. While in sleep mode, the data logger consumes a minimal amount of power.

MicroLogPRO *wakes up* every second for a few micro-seconds in order to check if one of the buttons has been pressed or if there is an incoming message from the

computer. For this reason, you must press and hold a button for at least two seconds before a status message appears.
If you use high sampling rates, the MicroLogPRO battery's lifespan will be considerably shorter (refer to Figure 5 below).

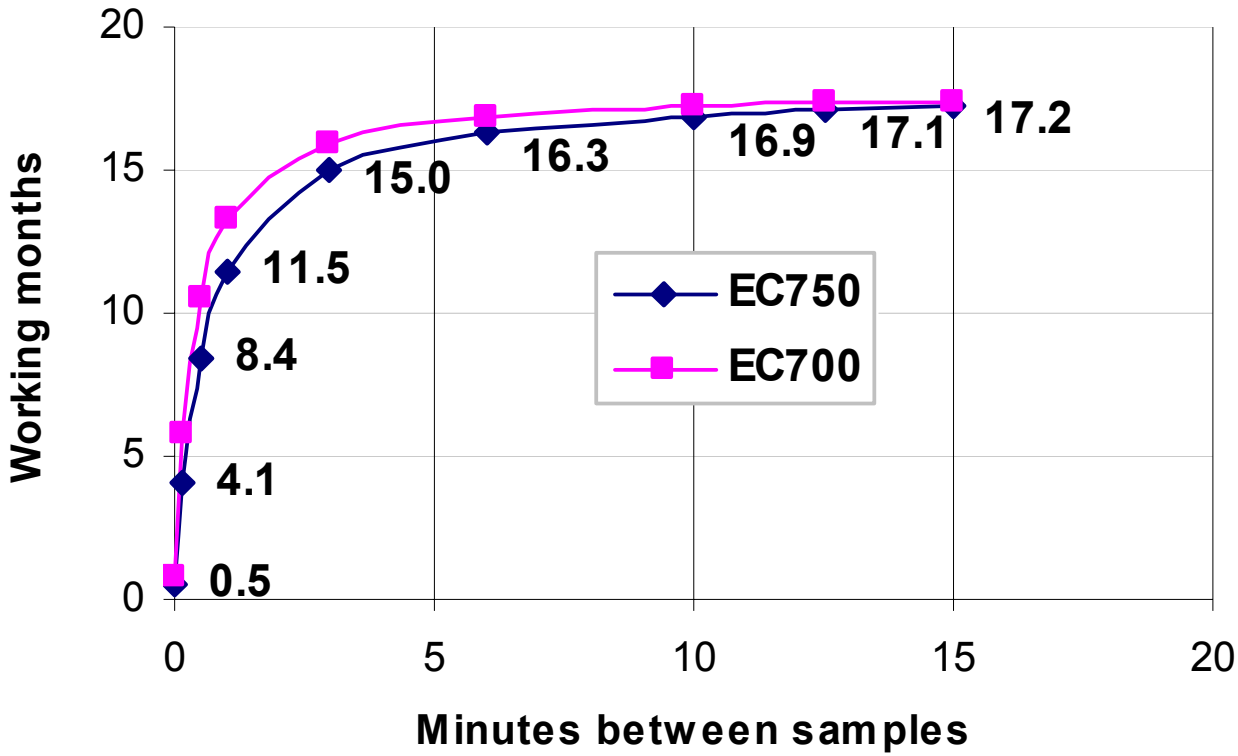


Figure 5: MicroLogPRO battery life

Note: The figures on the graph refer to MicroLogPRO usage without daily download and without viewing min/max values on MicroLogPRO's display.

2.3.7. Replacing the Battery

Warning: The back cover of the MicroLogPRO contains a special compartment for the built-in sensors, which are very fragile. When removing or replacing the cover, be careful not to harm the sensors.

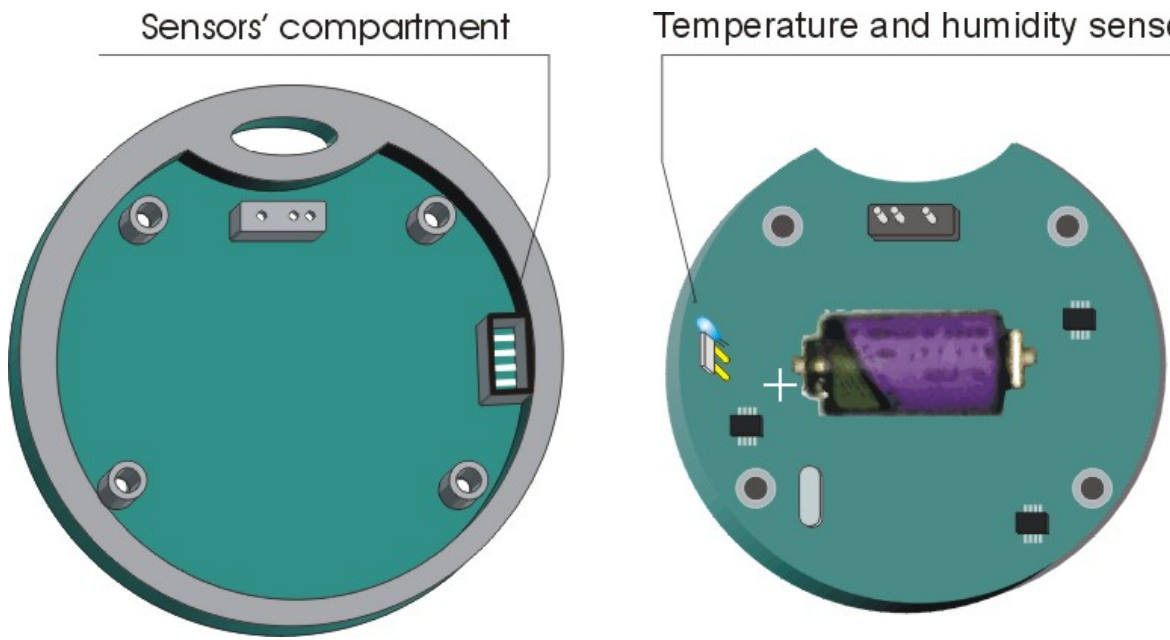


Figure 6: Replacing the battery

Note: The MicroLogPRO uses a 1/2AA 3.6V lithium battery.

1. Unfasten the four screws on the back of the MicroLogPRO.
2. Carefully remove the back cover.
3. Replace the battery, and be sure to insert the new battery into the correct corresponding polarities (look for the “” symbol next to the positive terminal).
4. Carefully reposition the electronic board on MicroLogPRO’s back cover and make sure that the humidity sensor is placed in its compartment.
5. Refasten the four screws on the back of the MicroLogPRO.

Chapter 3 Working with the MicroLab Software

The MicroLab software supports both the MicroLog (EC600 and EC650) and MicroLog PRO (EC700 and EC750) data loggers. This chapter describes how to operate MicroLab with both of these models, referred to jointly as *the data logger* throughout this chapter.

Chapter 3 MicroLab Software

3.1. Installation

3.1.1. System Requirements

To work with MicroLab, your system should be equipped with the following:

Software

- Windows 95 or later (Windows 95 will not support USB).
- Internet Explorer 4.0 or later

Hardware

- Pentium 300 MHz or higher
- 32 MB RAM (64 MB recommended)
- 5 MB available disk space for the MicroLab application

3.1.2. Installing the Software

1. Insert the CD into your CD drive.
2. The installation will start automatically. Once the process begins, follow the on-screen instructions.
3. If auto run is not working, open the CD drive folder and double-click the setup icon, then follow the on-screen instructions.

To uninstall the software: From the **Start** menu select **Settings > Control Panel**, and use the **Add/Remove Programs** tool to remove the MicroLab application.

3.1.3. Installing the USB Driver

To install the USB driver on Windows XP (to connect the EC750):

1. Connect your data logger to a USB port on your PC and turn the data logger on. Windows will automatically detect the new device and open the **Found New Hardware Wizard.**
2. Select the **No, not this time** to prevent Windows from searching for software on the Internet, then click **Next**.
3. Select the option **Install from a list or specific location** and click **Next**.
4. Select the option to search manually for the driver, and select the checkbox **Include this location in the search**. Browse to the location of the USB driver, either on your software CD or on your PC hard disk. The name of the driver folder is: **Logger USB Driver**.
5. Once you have located the driver folder, click **Next**. The driver will be installed on the PC.

6. Click **Finish.** Windows will open the **Found New Hardware Wizard** for the second time.
7. Click **Next** to complete the installation. Windows will automatically install the necessary components on your system.
8. Click **Finish**. The logger is ready to use and will now be detected by the PC.

To install the USB driver on Windows Vista Business (to connect the EC750):

1. Connect your data logger to a USB port on your PC and turn the data logger on.
2. Windows will not automatically detect the new hardware. From the **Start** menu, select **Computer**, and then click **System Properties** in the upper menu bar. In the **System** window, select **Device Manager** from the **Task** list on the left of the window.

3. In the Device Manager, locate the **Other devices** tree and right click on the **USB Serial Port** item. Select the **Update Driver Software** menu item.
4. Select the **Browse my computer for driver software**, and click **Next**.
5. Browse to the location of the USB driver, either on your software CD or on your PC hard disk. The name of the driver folder is: **Logger USB Driver**.
6. Once you have located the driver folder, click **Next**. The driver will be installed on the PC.
7. Click **Close** once the driver has been successfully installed. The logger is ready to use and will now be detected by the PC.

3.2. Overview

The **MicroLab** software was designed to allow for the programming of the desired data recording specifications for the data loggers,, to enable the downloading of recorded data to a PC, and to store, view and analyze the data.

The **Logger** menu handles all communication between the PC and the data logger, such as programming the desired recording mode, starting or stopping data recording, as well as downloading the data.

The **View** menu controls the various data display options. Data can be viewed in graph format, in table format, or in both. The **Data Map** is a separate pane that displays a list of the open data sets. It can also be used to quickly navigate through the data sets.

The **Graph** menu contains all the commands needed to format and edit the graph.
The most common tasks and commands are available as buttons on the **main toolbar** and on the **graph toolbar**.

3.2.1. Getting Started

Downloading Data

1. Connect the data logger to the PC.
2. Open the MicroLab software.
3. Click **Download** on the main toolbar.

Once the downloading has been completed, the data will be displayed both in the graph and in the table, and a new data icon will be added to the Data Map.

You can now connect a different data logger to the PC and download its data. The number of downloads is limited only by the memory available on the computer.
Use the Data Map (refer to page 60) to navigate between the different data sets.

Saving Data

To save the displayed data, click **Save** on the main toolbar. The data currently displayed by the graph will be saved in the MicroLab Data folder:

C:\Program Files\Fourier Systems\MicroLab\MicroLab Data

The data file name consists of the data logger name (Comment, refer to page 79) and of the time and date at which it was saved.

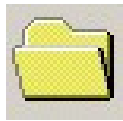
To save data in a different location or under a different name, use the **Save as…** command from the File menu:

1. Select **Save as…** from the **File** menu.
2. Enter a new name in the File name box.
3. To save the data in a different folder, select a drive and/or folder from the **Save in** dialog box.
4. Click **Save.**

If you've downloaded data from more than one data logger and you want to save all the data sets, select **Save all** from the **File** menu.

Note: If you want to remove unwanted data before saving, apply the crop tool (refer to page 68).

Opening Files

1. Click **Open**  on the main toolbar.
2. To open a document that was saved in a different folder, select a drive and/or folder in the **Look in** dialog box.
3. Double-click the file you want to open.

Displaying Properties

You can change the way numbers and dates will be displayed on screen.

1. Click **File** on the main menu, and then click **Display properties**.
2. Under **Decimal place settings**, enter the number of decimal places you want to display (enter a number between 0 and 4) for each sensor.

3. Under the **Date format settings**, select the desired format option.
4. Click **OK**.

Printing a Graph

1. Click **Print** on the main toolbar to open the **Print Options** dialog box.
2. Click the **Graph** option.
3. Click **Print** to open the **Print** dialog box.
4. Click **OK**.

Printing a Table

The displayed data can also be printed as a table. The table will only include data from sensors that are currently

represented on the graph (to learn how to add or remove data sets from the graph, refer to page 60) as well as the data logger name, serial number and the alarm level setup. Data that exceeds any of the alarm levels will be highlighted by arrows.

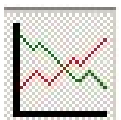
1. Click **Print** on the main toolbar to open the **Print Options** dialog box.
2. Click the **Table** option.
3. If you want to print only part of the data, uncheck the check box and select the desired time and date in the *From* and *To* boxes.
4. Click **Print** to open the **Print** dialog box and click **OK**.

3.2.2. Viewing the Data

Display Options

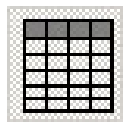
MicroLab's main window consists of three parts: the graph, the table and the Data Map. You can display all three parts simultaneously (the default view) or any combination of them.

Graph

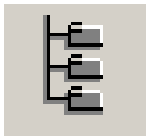
Click **Graph**  to display or remove the graph. The graph displays the data sets plotted vs. time. The graph usually displays all the data sets of a given data logger, but you can use the Data Map to remove one or more of the sets from the graph (refer to page 60).

In order to keep the graph clear and simple, only two Y-axes can be shown on the graph simultaneously. If there are three curves in the graph, one of the Y-axes will be hidden. To make this axis visible, select the corresponding plot with the cursor (refer to page 62).
You can identify the Y-axis by its color, which matches the plot color.

Table

Click **Table**  to display or remove the table.
The data in the table always matches the data that is currently displayed on the graph.

Data Map

Click **Data Map**  to display or remove the Data Map.

The Data Map is a separate window that displays the list of data sets that were downloaded or opened in the current session. Use the Data Map to navigate through the available plots and to keep track of the data that is displayed in the graph and/or table windows.

When you double-click on a MicroLog icon in the Data Map, MicroLab jumps to the corresponding data and displays it in the graph and table windows. It also expands the Data Map to show the individual sensors included with the selected logger.

A graph icon indicates that the data set is currently being displayed. Double-click on the icon to clear the data set from the display.

An empty icon indicates that the data set is not being displayed. Double-click on the icon to add the data set to the display.

To collapse the sensor list under an individual data logger, click the minus sign (-) next to the logger icon.

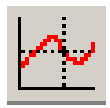
To display the complete sensor list under an individual data logger, click the plus sign (+) next to the logger icon.

To remove an individual logger from the Data Map, right-click on its icon, then click **Remove data**.

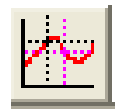
To remove all data sets from the Data Map, right-click the Data sets icon , then click **Remove all data**.

The Cursor

Use the cursor to view individual data recording values, or to reveal a hidden Y-axis. MicroLab enables you to display up to two cursors simultaneously.

To display the first cursor, double-click on an individual data point or click **Cursor**  on the graph toolbar. You can drag the cursor with the mouse to any other point on the plot, or to another plot altogether.

The point coordinates of the selected data recording will appear in the status bar at the bottom of the graph window.

To display a second cursor, double-click anywhere on the graph or click **Second cursor**  on the graph toolbar.

Zooming and Panning

1. Zooming

Click **Zoom in** on the graph toolbar and drag the cursor diagonally to select the area you want to magnify. Release the mouse button to zoom in to the selected area.
Click on the **Zoom in** button a second time to turn off the Zoom tool.

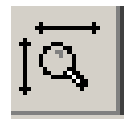
2. Autoscale

Click **Autoscale** on the graph toolbar for the full data display.

Double-click on an individual axis to auto scale it separately.

3. Manual scaling

a. Click **Graph properties** on the graph toolbar to open the **Graph Properties** dialog box.
b. Select the **Scale** tab, and choose the axis you want to scale in the **Select axis** drop-down menu.
c. Unselect the **Auto scale** check box and enter the new values in the value fields.
d. In the time axis, you can either enter the time and date manually, or select it with the up and down arrow buttons.
e. Click **OK**.

To restore auto scaling, click **Autoscale**  .

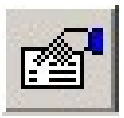
4. Default zooming

If you usually need to view a specific time frame (i.e. workday hours), use the Default zooming tool. You can set the start and end time of the time span and then use it whenever you open a file or download data from the MicroLogPRO.

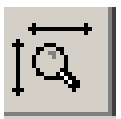
To set the default zoom:

a. Click Graph Properties on the graph toolbar, then click **Set Default Zoom**.
b. Enter the start and end times, then click **Set**.

To zoom to the default zoom:

a. Click **Graph Properties**  on the graph toolbar.
b. Check the **Use default zoom** check box and click **OK**.

Every file and every data recording you download will automatically open in the default zoom as long as the **Use default zoom** check box remains selected.

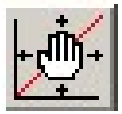
To restore auto scaling, click **Autoscale**  .

5. The Stretch/Compress Axis Tool

Move the cursor onto one of graph axes. The cursor icon changes to a double arrow symbol (↔), indicating that you can stretch or compress the axis scale. Drag the symbol to the desired location. Repeat the procedure for the other axis, if necessary.

6. Panning

Use the pan tool after zooming any part of the graph that is outside the zoomed area.

To do so, click **Pan**  on the graph toolbar, then click anywhere on the graph and drag the graph to view another area.

Click **Pan** a second time to turn off the Pan tool.

Cropping the Data

Cropping enables you to trim the edges of a data set. Use it to remove unwanted data.

1. Zoom to the data range you want to keep.
2. Click **Graph** on the menu bar, then click **Crop**.
   All data outside the zoomed area will be **permanently** removed.

Formatting the Graph

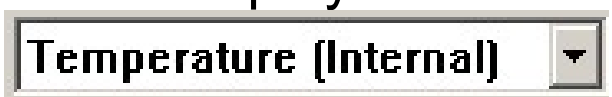
You can change a data line's color, style or width. You can also add markers that represent the data points on the graph and format their style and color.
The Y-axis color matches the corresponding plot's color and will change accordingly. The time axis color can be changed separately:

1. Click **Graph properties** on the graph toolbar to open the **Graph Properties** dialog box.
2. Select the **Lines** tab, then select the plot or axis you want to format in the **Select plot** drop-down menu.
3. From here, you can format the line's color, style and width, as well as the markers' color and style. To

remove the line or the marker, uncheck the corresponding visible check box.

4. To restore the default formatting, click **Restore default**, and click **OK**.

Displaying Alarm Levels

1. Click **Display alarm level** .
2. Select the sensor you wish to display from the **Select sensor** drop-down menu 

Changing the Temperature Units

Click **Toggle °C/°F** button

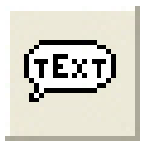
to change the temperature scale from Fahrenheit to Celsius and vice versa.

Note: To change the units in the data logger display, use the **Setup** dialog box (refer to page 78).

Adding Annotations to the Graph

MicroLab allows you to add annotations to the graph. An annotation is always attached to a specific data point.

To add an annotation:

1. Place the cursor on the point to which you want to add the annotation.
2. Click **Add new annotation**  on the graph toolbar
3. Type the annotation in the **New annotation caption** text box.
4. Click **OK**.

To move an annotation:

1. Click **Move annotation** on the graph toolbar
2. Drag the annotation to any location on the graph you choose.
3. Click **Move annotation** a second time.

To edit an annotation:

1. Place the cursor on the point to which the annotation is attached.
2. Click **Graph** on the menu bar.
3. Click **Edit annotation.**
4. Edit the annotation in the text box.
5. Click **OK.**

To delete an annotation:

1. Place the cursor on the point to which the annotation is attached.
2. Click **Graph** on the menu bar.
3. Click **Delete annotation.**

To hide all annotations:

1. Click **Graph** on the menu bar.
2. Click **Show annotations** to uncheck it.

Exporting Data to Excel

Click **Export to Excel** to export the currently displayed data to an Excel spreadsheet. MicroLab will open a new

Excel workbook displaying the data along with the logger info, including the logger name, serial number and alarm levels setup.

Export File Settings

If MicroLab fails to export the data properly i.e. all of the data is displayed in one row of the worksheet, you can change the export file settings. This ensures that the data is exported using comma separated values (CSV).

1. Click **File** on the main menu, then click **Export file settings,**
2. Select the **Ignore regional settings** check box.
3. Click **OK.**

Copying the Graph as a Picture

You can copy the graph to the clipboard as a picture and then paste it into other Windows programs, such as Word and PowerPoint:

1. On the **Graph** menu, click **Copy graph**.
2. Open the destination file.
3. In the destination file, right-click and select **Paste**.

Viewing more than one data set on the graph

MicroLab lets you view more than one data set in Graph and Table view at the same time, allowing you to compare the data from several data sets side by side.

Note: To use this feature the data sets must have been recorded using the same sampling rate e.g. every 1 minute

There are two modes when using the Multi-graph feature:

- Standard mode

The time scale of all data on the graph is the same. The time and date of data recorded in the first data set included on the graph is used.
For example, if you have a graph whose data was recorded starting 10:00AM on August 11, then all additional data added to the graph will be displayed with the same recording date.

The MicroLab data table below shows all data in the graph having the same time scale:

		MicroLog PRO	MicroLog PRO 3	MicroLog PRO 4
	Time (Date)	Humidity (%)	Temperature (°C)	Temperature (°C)
0	10-Aug-06 16:53:50	39.0	25.90	22.80
1	10-Aug-06 16:54:00	39.1	25.90	22.80
2	10-Aug-06 16:54:10	39.1	25.90	22.80
3	10-Aug-06 16:54:20	39.1	25.90	22.80
4	10-Aug-06 16:54:30	39.1	25.90	22.80
5	10-Aug-06 16:54:40	39.1	25.90	22.80
6	10-Aug-06 16:54:50	39.2	25.90	22.80
7	10-Aug-06 16:55:00	39.2	25.90	22.80
8	10-Aug-06 16:55:10	39.2	25.90	22.80
9	10-Aug-06 16:55:20	39.1	25.90	22.80

- Plot sync mode

To display data on the graph using the data's actual time scale i.e. the time and date when the data was actually recorded, use the **Plot sync** feature. This will also shift all data in the data table accordingly.

Once you've added the data to the graph, on the **Graph** menu, select **Plot sync** to enable the feature. To return to Standard mode, unselect **Plot sync**.

Note: The time scale of all data is rounded to the same resolution as the time scale of the original data on the graph.

3.2.3. Programming the Data Logger

Setup

Use the **Setup** dialog box to view or change the data logger parameters.

Note: If you intend to setup more then one logger, use the **Save Setup** tool (refer to page 87).

1. Connect the data logger to the PC.

2. Click **Setup**

to open the **Setup** dialog box.

The dialog box consists of five sections:

- **Data logger info**

Comment

Click the text box and type a name that will serve to identify the specific data logger (e.g. its location).

S/N

Displays the data logger's serial number.

Battery Level

If the indicator is in the red zone the battery should be replaced (refer to page 41).

- **Cradle info**

*Cradle ID **

The cradle's identification number sets the cradle's transmission time in daily download mode.

** The Cradle is the data logger's wireless transmitter unit. Refer to the separate MicroLog wireless solution user guide for more information.*

Battery Level

If the indicator is in the red zone, the battery should be replaced.

- **Setup**

Temperature

Select the **Temperature** check box to activate the internal temperature sensor.

Humidity

Select the **Humidity** check box to activate the internal humidity sensor.

External

Select the **External** check box to activate the external sensor option, and then select a sensor in the drop-down menu.

If you want to use a sensor that is not found in the drop-down menu, you can define a new sensor (refer to page 95).

Note: The sensors' current readings will appear next to the sensor name once the data logger begins logging for the first time.

Temperature unit

To set the temperature unit in the logger display, select the option you want (Celsius or Fahrenheit).

Interval

This determines the logging interval, or the time interval between successive data recordings.
The time format is hh:mm:ss. Set the time setting to select a recording time interval from 10 seconds to 2 hours. For example, to set a time interval of one hour, five minutes and thirty seconds, click the hours (hh) and type 1 or use the arrows to select 01. Click the minutes (mm) and type 5 or use the arrows, and

finally, click the seconds (ss) and type 30 or select 30 using the arrows.

Timer run

Select the **Timer run** check box if you want the data logger to start recording at a predetermined time. This option is convenient if you are using several loggers at once and want them to all begin logging at the same time.

Use the time and date selectors to set the start time.

Cyclic run

In **Cyclic run** mode, the data logger overwrites the old measurements (starting with the oldest recorded data) once the loggers's memory is full. Click the **Cyclic run** check box to operate in this mode.

If the check box is clear, the data logger will operate

in **Normal run** mode and will stop recording when the memory is full.

Push to run

In **Push to run** mode, the data logger will only start recording data when you press either the left or right logger button. It is convenient for when you wish to start recording data soon (but not immediately) following setup, or at an unspecified time.

*Daily download **

Select the **Daily download** checkbox to enable automatic daily download (refer to page 101 for details).

** The Daily Download is a feature described in the separate MicroLog wireless solution user guide.*

- **Alarm levels**

Type in the desired minimum and maximum alarm levels. For the MicroLogPRO model only, if it records a reading that exceeds either of these alarm levels, the logger's LCD will display alarm notification.

To remove the alarm sign from the display, press either of MicroLogPRO's two buttons. The default alarm levels are the lower and upper ends of the sensors. Click **Cancel Alarm** to restore the default levels.

- **Alarm time settings**

This feature is only relevant when using the wireless cradle transmitter. Refer to the separate MicroLog wireless solution user guide.

Completing the Setup

Click **Send Setup** to send the new settings to the data logger. This will complete the setup. Click **Cancel** if you do not wish to change the setup at this stage.

Note: The **Send Setup** command erases all existing data in the logger.

If you select **Timer run** mode, the data logger will wait in standby mode, displaying . It will begin recording at the specified time.

Saving Setup

When setting up multiple loggers, use the **Save Setup** option in the **Setup** dialog.

1. After you have finished the settings selection of the first logger and before sending the setup command, click **Save Setup** to save all of the setup settings.
2. Connect another logger to the PC and click **Setup**

on the main menu.
3. Click **Load Setup** to load your setup settings.
4. Change the Comment (optional).
5. Click **Send Setup**.

Starting Data Recording

Click **Run** every time you want to start a new recording. The **Run** command erases all previous data in the data logger's memory and begins recording.

Note: If you setup the data logger using the Setup command, it will automatically begin recording, and you don't have to click **Run**.

Stopping Data Recording

Click **Stop**

to stop recording. In Stop mode, the data logger keeps all recorded data but does not record new data. Use this mode to save battery power.

3.2.4. Sensor Calibration

A new data logger comes fully calibrated. After a long period of use however, you may want to recalibrate the humidity or the temperature sensors.
The calibration affects both the logger and MicroLab and should be carried out while the logger is connected to the PC.

Calibration Password

To prevent accidental change of the calibration, the calibration procedure is protected by a password. The default password is: 1234. To change the password:

1. Click **Logger** on the main menu, then click **Calibration**.
2. Click **Change Password** to open the **Change Password** dialog box.
3. Enter the current password in the **Current Password** field.
4. Enter the new password in the **New Password** field.
5. Enter the new password a second time in the **Confirm New Password** field to confirm your new password.
6. Click **OK**.

Note: The password must include at least 4 characters and is **case sensitive.**

Humidity Calibration

Note: The Humidty calibration is performed directly onto the data logger, meaning the logger itself is calibrated, not the software.

To calibrate the humidity sensor you will need a humidity chamber.

1. Connect the data logger to the PC.
2. Set up the logger to record every one minute (refer to page 78).
3. Click **Logger** on the main menu, then click **Calibration**.

4. Enter the calibration password, then click **OK**.
5. Select Humidity in the **Choose sensor** drop-down menu.

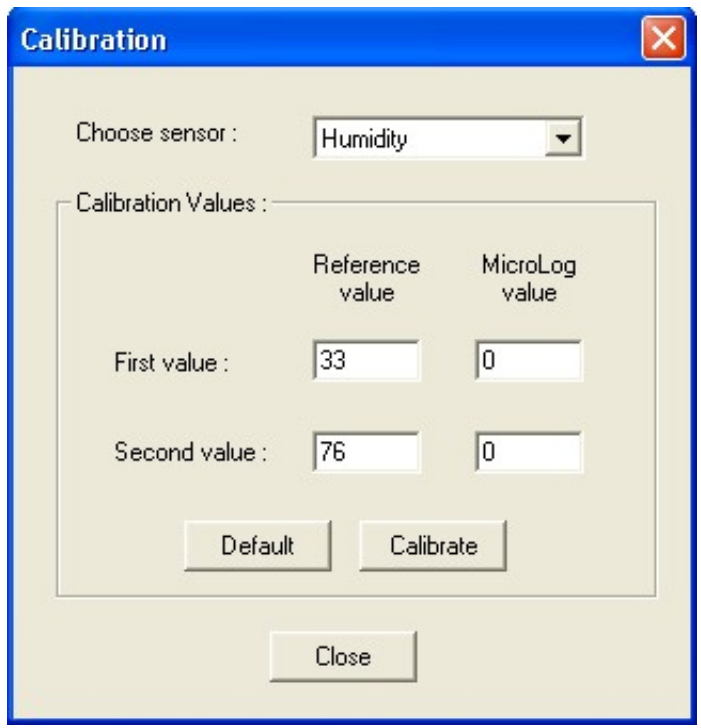


Figure 7: Humidity calibration

6. Click **Default** to restore the original values.
7. Disconnect the data logger from the PC and insert it into the humidity chamber.
8. Set the humidity chamber to the first reference value. Wait until the humidity level is stabilized and write down the logger's reading.
9. Repeat the last step with the second reference value.
10. Connect the logger to the PC and enter the Calibration dialog.
11. Enter the two logger values into the MicroLog value text boxes.
12. Enter the two reference values into the Reference value text boxes.
13. Click **Calibrate**.

To restore default calibration, click **Default**.

Temperature Calibration

Note: For the MicroLog model, the Temperature calibration is performed in the software. The logger itself is not calibrated. When calibrating the MicroLogPRO model, calibration is performed directly onto the data logger, meaning the logger itself is calibrated, not the software.

1. Connect the data logger to the PC.
2. Click **Logger** on the main menu, then click **Calibration**.
3. Enter the calibration password, then click **OK**.
4. Select the desired temperature sensor in the **Choose sensor** drop-down menu.
5. Click **Default** to restore the original values.

6. Enter the two logger values into the MicroLog value text boxes.
7. Enter the two reference values into the Reference value text boxes.
8. Click **Calibrate**.

To restore default calibration, click **Default**.

3.2.5. Defining a Custom Sensor

You can use the data logger with any sensor that has a 0 – 20 mA current output or a 0 – 10V voltage output.

1. Click the **Logger** on the main menu and then select **Define new sensors** to open the **Define New Sensor** dialog box.
2. Click **Add** to add a new sensor to the list.

3. In the **Based on** drop-down menu, select an external sensor that matches your sensor's output.
4. Type the sensor's name in the **Sensor Name** text box.
5. Type the sensor's unit in the **Sensor Unit** text box.
6. In the **Calibration Values** section, enter two values of your sensor that correspond to the base sensor values. For example, see the definition for a 0 – 100 mbar pressure sensor whose output is 0 – 20 mA:

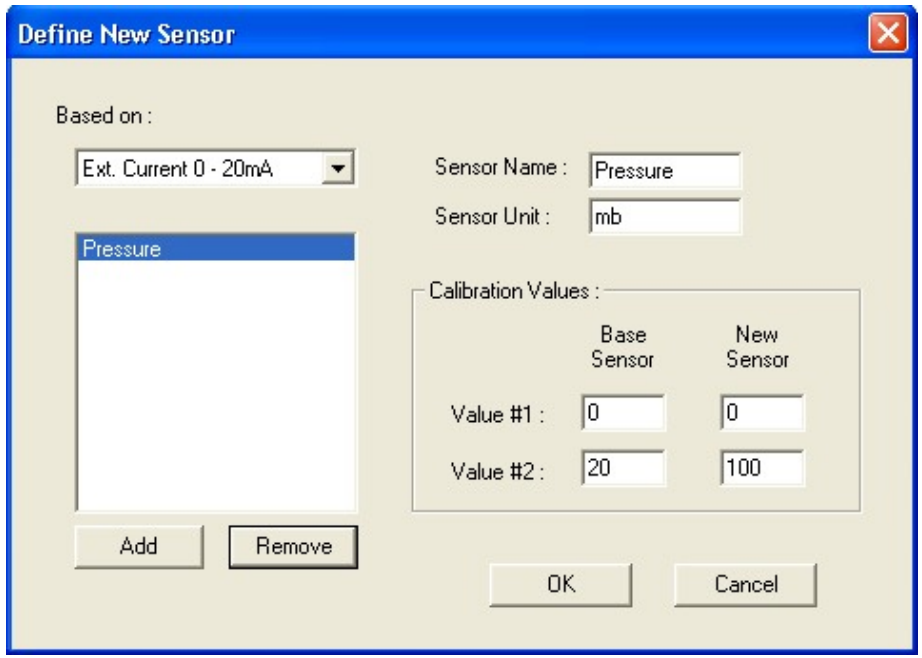


Figure 8: Defining a new sensor

7. Click **OK**.

The new sensor will then appear in the External Sensor list in the **Setup** dialog box.

3.2.6. Communication Options

Setting IR Printing Format (for the MicroLogPRO only)

1. Connect the data logger to the PC.
2. Click **Logger** on the menu toolbar, then click **MicroLogPRO IR Print Settings**:

Figure 9: IR Print Settings dialog box

3. Select a format option:
    a. Print Format 1 – Prints the minimum and maximum values of a selected time period up to the last 30 days (refer to page 37).
    b. Print Format 2 – Prints all data up to 128 rows of data
4. If you selected *Print Format 2*, enter the desired number of rows (up to 128).
5. Click **OK.**

Communication Setup

Communication between the PC and the data logger device takes place automatically whenever you send a command to the logger. However, the Communication Setup dialog box can be used for more advanced communication options.

Click **Logger** on the main menu and select **Com setup** to open the **Communication Setup** dialog box:
If you are not using a Receiver and Cradle, uncheck the **Search for Receiver and Cradle** checkbox in order to speed up the search.

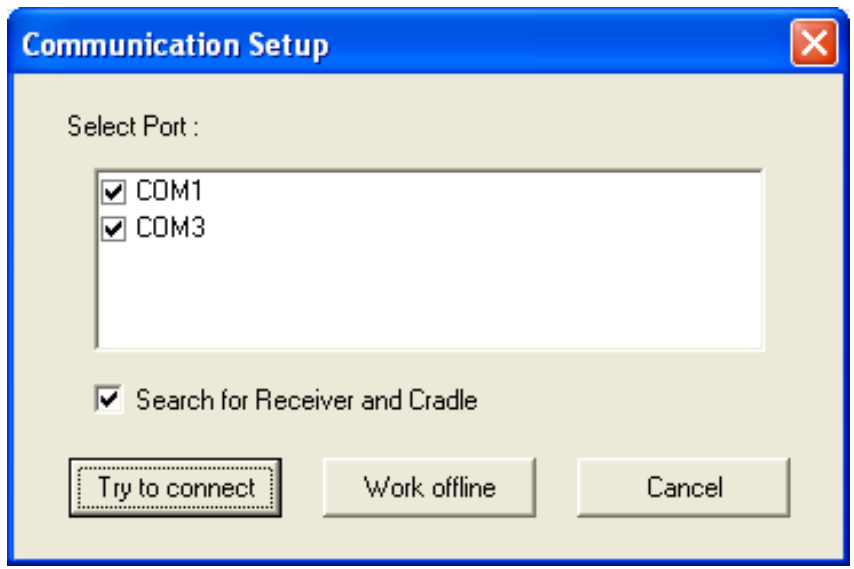


Figure 10: Communication Setup dialog box

The selected COM ports are available for communication.

1. Click **Try to connect** to establish communication.
2. Click **Work offline** to work with saved files.

Automatic Daily Download

Refer to the separate MicroLog wireless solution user guide which describes this feature in detail.

3.2.7. Analysis Tools

Setting the Analysis Tools Parameters

1. Click **Analysis** on the menu bar, then click **Set Functions' Parameters** to open a dialog box:

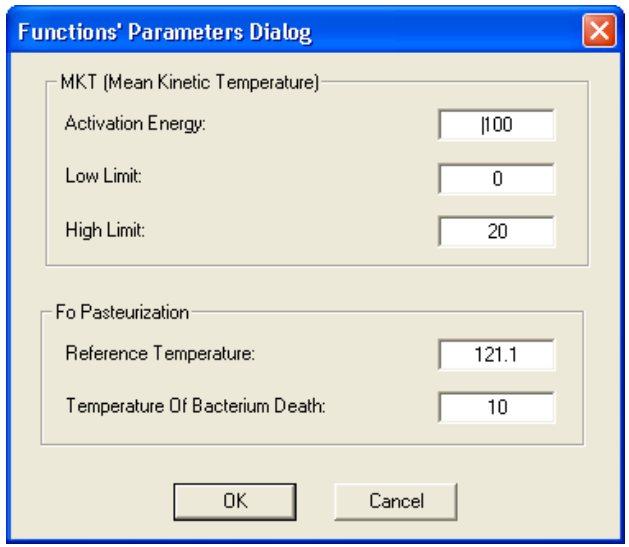


Figure 11: Functions Parameters

2. Type in the desired parameters, then click **OK.**

Histogram

Use this tool to create a frequency distribution of the selected data set.

To create a histogram:

1. Use the cursor to select a plot on the graph.
2. Click **Analysis** on the main menu bar, then click **Histogram.**

MicroLab displays a histogram of the selected data and creates a new entry in the Data Map.
Use the Data Map (refer to page 60) to hide the histogram or to return to the original data sets.

You can modify the histogram to your needs. You can set the upper limits of the first bin and the lower limit of the last bins, and refine the histogram by increasing the number of bins.

To modify the histogram:

1. Click **Analysis** on the main menu, then click **Histogram** a second time to open a dialog:

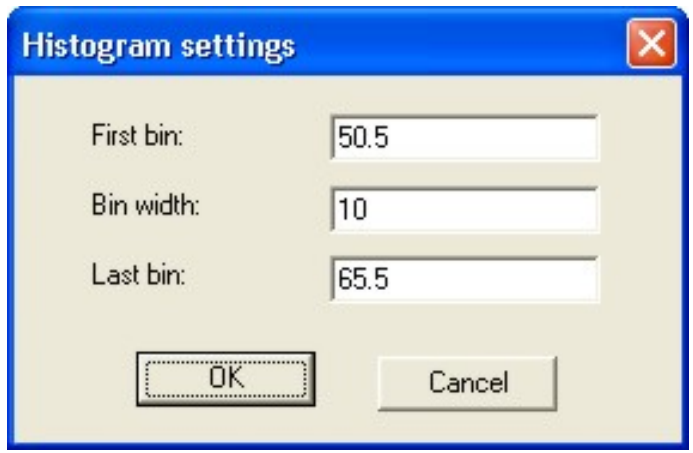


Figure 12: Histogram settings

2. Enter the desired values for the first bin, the bin width and last bin, then click **OK.**

You can repeat the process for further modification.

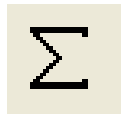
Pasteurization

Use this tool to create and display an FO Pasteurization curve:
Click **Analysis** on the menu bar, then click **FO pasteurization.**

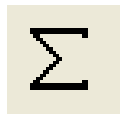
Statistics

Use the statistics tool to display statistics of each data set in the graph.
The statistics include:
Minimum – The smallest value in the data set.
Maximum – The largest value in the data set.
Average – The average of all the numbers in the data set.
MKT – The mean kinetic temperature (for temperature data only).

To display statistics:

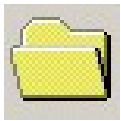
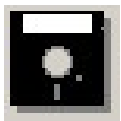
Click **Statistics**  on the main toolbar.

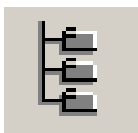
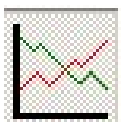
MicroLab will display the statistics in the information bar at the bottom of the graph window.

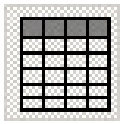
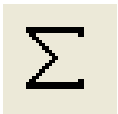
To hide the statistics, click **Statistics**  a second time.

3.2.8. Toolbar Buttons

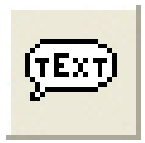
Main (Upper) Toolbar

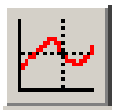
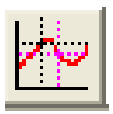
	*Open*	Opens saved files
	*Save*	Saves the data that is currently displayed
	Print…	Opens the Print Option dialog box
	Export	Exports the displayed data to an Excel spreadsheet

	Run	Begins recording data
	Stop	Stops recording data
	Setup	Opens the Setup dialog box
	Download	Downloads data from the data logger onto the PC
	*Data Map*	Displays or removes the Data Map
	*Graph*	Displays or removes the graph

	*Table*	Displays or removes the table
	*Statistics*	Displays or removes the data's statistics
	°C/°F	Displays the desired unit of temperature
	Alarm	Displays or removes alarm levels from the graph

Graph (Lower) Toolbar

	*Add annotation*	Adds new annotation to the graph
	Move annotation	Relocates the annotation on the graph
	Zoom in	Activates the zoom tool
	Pan	Activates the pan tool
	Autoscale	Returns the graph to full view

Graph properties	Opens the Graph Properties dialog box
 *Cursor*	Toggles the first cursor
 *Second cursor*	Toggles the second cursor

Chapter 4 External Sensors

The MicroLog and MicroLog PRO work with the following external sensors:

4.1. Temperature -50 °C to 100 °C/ 110 °C (Thermistor-based)

Takes external temperature measurements over a wider range than the internal temperature sensor and with a faster response time.

Specifications:

Range: MicroLog: -50 °C to 100 °C

MicroLogPRO: -50 °C to 110 °C

Resolution:	MicroLog: Better than 1 °C between -20 °C to 75 °C
	MicroLogPRO: Better than 0.3 °C between -30 °C to 90 °C
Accuracy:	MicroLog: 2% of reading (before calibration)
	MicroLogPRO: 1 °C (before calibration)
Probe Length:	100 mm
Probe OD:	3.2 mm
Probe Max. Temperature:	150 °C
Cable Max. Temperature:	80 °C

4.2. Voltage Sensor

Measures any device or transmitter that produces a linear analog output of 0-10 V. The voltage can easily be converted to the correct measured units with the help of the MicroLab software.

Specifications:

Range:	0 to 10 V
Resolution:	MicroLog: 0.05 V
	MicroLogPRO: 0.01 V
Accuracy:	MicroLog: ±3% before calibration
	MicroLogPRO: 1% from reading ± 0.02 V
Input Impedance:	MicroLog: 3MΩ

MicroLogPRO: 25 kΩ

Calibration: Two point calibration

OV Protection: 30 V

4.3. Current Sensor

Samples any device or transmitter producing a linear current of 0-20 mA. The 0-20 mA can be converted to the correct measured units using the MicroLab software's Calibration option.

Specifications:

Range: 0 to 20 mA

Resolution: 0.01 mA

Accuracy: 1% from reading ± 0.006 mA

Input Impedance: 166 Ω

OV Protection: MicroLog: 55 mA

MicroLogPRO: 100 mA

4.4. pH Sensor

Monitors the pH level of liquids.

Specifications:

Range: 1 to 14 pH

Resolution: MicroLog: 0.116 pH

MicroLogPRO: 0.02 pH

Accuracy: MicroLog: 5% of reading

MicroLogPRO: 3% of reading

Specifications

MicroLog

Models:

EC600: Temperature and external sensor data logger

EC650: Temperature, relative humidity and external sensor data logger

Inputs:

Two built-in sensors:

Temperature

Range: -30 ˚C to 50 ˚C

Specifications

Resolution: 0.5 ˚C

Accuracy (all ranges): 0.6 ˚C

Response time: ~ 15 minutes

Software calibration is possible

Relative Humidity:

Range: 0 to 100%

Resolution: 0.5%

Accuracy: 3%

Response time: ~ 25 minutes

Software calibration is possible

External Sensors:

Refer to Chapter 6.

Outputs:

Two digit 7-segment LCD with decimal point

Wireless rapport to infrared HP printer HP82240B

RS232 serial communication at 19,200 bps

Memory Capacity:

16,000 samples

LCD Unit Icons:

˚C, ˚F, %RH

Specifications

Power Supply:

Internal Lithium Battery: 3.6 V, 1.2 AH, 1/2 AA

Battery Life: Approximately two years. May vary with number of sensors connected and the sampling rate settings (for more details refer to page 39).

Sampling Rate:

User defined: From once every 10 seconds to once every 2 hours

Dimensions:

Diameter: 72 mm

Thickness: 22.9 mm

Weight: 55 g

Standards:

Water and dust proof IP65 standard compliance

CE and FCC standard compliance

MicroLogPRO

Models:

EC700: Temperature and external sensor data logger

EC750: Temperature, relative humidity and external sensor data logger

Inputs:

Two built-in sensors:

Temperature

Specifications

Range: -40 ˚C to 80 ˚C

Resolution: 0.2 ˚C (-40 ˚C to -20 ˚C)
0.1 ˚C (-21 ˚C to 50 ˚C)
0.2 ˚C (51 ˚C to 80 ˚C)

Accuracy (all ranges): 0.2 ˚C

Response time: ~ 15 minutes

Software calibration is possible

Relative Humidity:

Range: 0 to 100%

Resolution: 0.1%

Accuracy: 2%

Response time: ~ 25 minutes
Software calibration is possible

External Sensors:

Refer to Chapter 6.

Outputs:

Four digit 7-segment LCD with decimal point

Wireless rapport to infrared HP printer HP82240B

RS232 serial communication at 19,200 bps

USB 1.1 for EC750 only (optional – low water and dust protection)

Specifications

Memory Capacity:

1 sensor	52,000 samples
2 sensors	26,000 samples
3 sensors	16,000 samples

LCD Unit Icons:

˚C, ˚F, %RH, pH, V, mA, mS, AL-H, AL-L

Power Supply:

Internal Lithium Battery: 3.6 V, 1.2 AH, 1/2 AA

Battery Life: Approximately two years. May vary with number of sensors connected and the sampling rate settings (for more details refer to page 39).

Sampling Rate:

User defined: From once every 10 seconds to once every 2 hours

Dimensions:

Diameter: 72 mm

Thickness: 22.9 mm

Weight: 55 g

Standards:

Water and dust proof IP65 standard compliance

CE and FCC standard compliance

Software

MicroLab Software Features

Runs on WINDOWS 98/2000/ME/XP and Vista
Fast data download
Graphic visualization of the logger data
Data displayed in graphs and tables
Data export to EXCEL
Graphic analysis tools such as Markers, Zoom
Logger Setup windows, for setting up the logger unit ID, sample rate, sensors and alarm level
Sampling rate: Once every 10 seconds to 2 hours
Definition of additional external sensors
Logger sensor calibration
Display of logger Battery Level

Visual alarm levels on the graph and table

MicroLab System Requirements

Software

Windows 98 or later
Internet Explorer 4.0 or later)

Hardware

Pentium 300MHz or higher
32 MB RAM (64 MB recommended)
5MB available disk space for the MicroLab application

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